

BULLETINS
OF THE
ZOOLOGICAL SOCIETY OF SAN DIEGO

No. 12

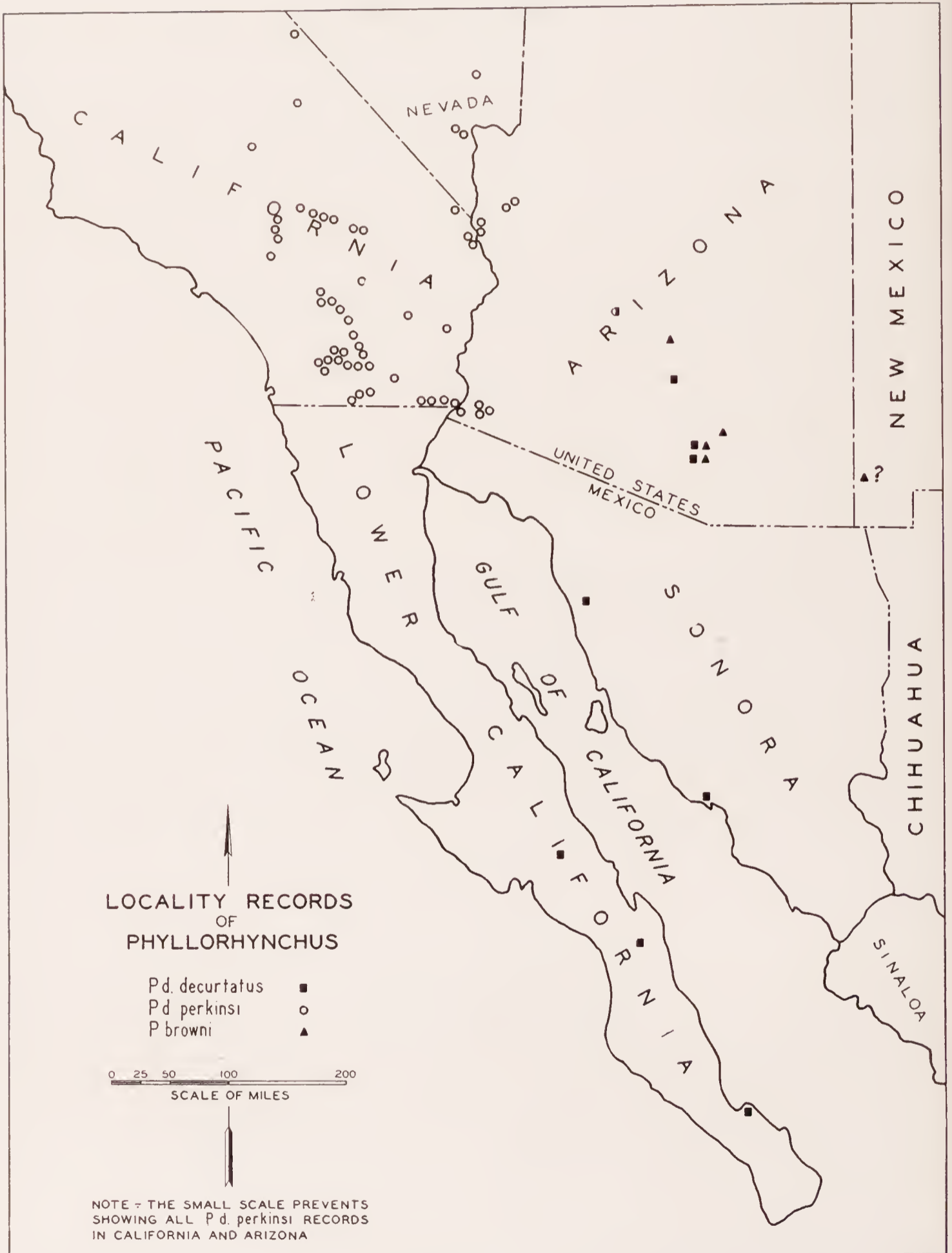
PHYLLORHYNCHUS, THE LEAF-NOSED SNAKE

BY L. M. KLAUBER

Curator of Reptiles, Zoological Society of San Diego

SAN DIEGO, CALIFORNIA

SEPTEMBER 12, 1935



PHYLLORHYNCHUS, THE LEAF-NOSED SNAKE

INTRODUCTION

The Leaf-nosed Snakes of the genus *Phyllorhynchus* are small, stubby snakes inhabiting the arid regions of the southwestern United States and northwestern Mexico. Until recently they were considered extremely rare; now it is known that they are rather plentiful in many areas, but being nocturnal, have not often been collected.

Two species have been described, *P. decurtatus* and *P. browni*. Both are characterized by the presence on the snout of a greatly enlarged rostral scale resembling a superimposed leaf, from which the generic and common names are derived.

The first specimen of the genus was described in 1868 by Cope¹ as *Phimothyra decurtata*. In 1890 Stejneger² established the genus *Phyllorhynchus* for this and a second, newly discovered species, *P. browni*, which he then described.

As an indication of the rarity of these snakes in museums it may be noted that, from the date of their discovery in 1868 to 1922, there were added to collections only 6 specimens of *decurtatus* and 4 of *browni*. More recently the motor car has so changed the technique of reptile collecting,³ particularly of nocturnal snakes on the desert, that a large amount of new material has become available; over 165 specimens, mostly of *decurtatus*, are now at hand and previously known ranges have been considerably extended. It therefore appears desirable to review our knowledge of the genus, to consider the validity of the forms hitherto described, and to indicate the dispersion of characters shown by this new material, thus determining whether further subdivisions are advisable.

¹ Proc. Acad. Nat. Sci. Phila., 1868, p. 310.

² Proc. U. S. Nat. Mus., 1890, Vol. 13, pp. 151-155.

³ KLAUBER, Bull. Zool. Soc. San Diego, 1931, No. 8, pp. 41, 61.

THE VALIDITY OF *PHYLLORHYNCHUS BROWNI*

Stejneger, in describing *browni*, distinguished it from *decurtatus* on the basis of a number of characters, including stouter build, longer tail, keeled posterior dorsal scales, fewer ventrals, higher number of caudals, lack of lateral spots, and fewer dorsal blotches. Gradually, as additional specimens of the genus have come into collections, most of these characteristics have failed to hold; the tail-length ratio is found to overlap (the difference originally pointed out was probably one of sexual dimorphism); the caudals overlap; lateral spots are sometimes faintly evident in *browni*; and in *decurtatus* specimens are not wanting with strongly keeled posterior dorsal scales, for this is a sexual and territorial characteristic. As to the ventrals, while it is true that California specimens of *decurtatus* have a distinctly higher number than are present in seven of the eight available specimens of *browni*, yet the Lower California, Sonora, and Pima County (Arizona) specimens of *decurtatus* overlap *browni*; and the most westerly known specimen of *browni* approaches the *decurtatus* average.

There remains, then, only the item of the body blotches, but here the difference between the two forms is so pronounced that I do not consider *browni* a subspecies of *decurtatus*, as recently suggested by Linsdale.⁴ One hundred and fifty-nine specimens of *decurtatus* from California, Lower California, Nevada, Arizona, and Sonora have an average of 35.6 body spots, with an extreme range of variation of 20 to 48. Of *browni* only eight specimens are available; the body blotches on these number thirteen in three, twelve in three, and eleven in the remaining two; average 12.1. It need hardly be said that we have here a highly significant difference, for the minimum spots on *decurtatus* number nearly twice the maximum of *browni*, and the averages of the two forms are in the ratio of about three to one. Furthermore there is no tendency toward fewer spots in *decurtatus* as the territory of *browni* is approached; in other words no intergradation

⁴ COPEIA, 1933, pp. 222-223.

is indicated by material now available. The patterns of the two forms are also quite different in character. Thus it is necessary to conclude that the species are distinct.

Such confusion as has existed in the past concerning the status of the two forms of the genus resulted from lack of material and the peculiarities of the ranges. For a long time *browni* was known only from the vicinity of Tucson, Arizona, while *decurtatus* was thought to be essentially a California form, not having been collected east of Yuma; thus there was a gap of 200 miles between their known ranges. There was one troublesome specimen (AMNH 20590) from near Tucson which had 42 body spots; for territorial reasons this was catalogued as *browni*, thus breaking down the blotch-count as a key character. But additional material has shown that the ranges of the two forms overlap, for both occur in south-central Arizona; when this Tucson specimen is reclassified as *decurtatus* the situation is at once made clear.

Of course a question may be raised as to the propriety of separating two forms morphologically so similar, upon a basis of pattern, especially as their ranges overlap. In the present instance the numerical hiatus in the blotch count is so great that there appears little chance that intermediates will be found. In fact specimens of *decurtatus* from *browni* territory tend to have a high number of blotches; *decurtatus* has the fewest spots in the Cape Region of Lower California and in southern Sonora, and there *browni* does not occur.

There remains the possibility that *browni* is an expression of sexual dimorphism. This is doubtful, even though it appears that all the specimens of *browni* thus far available are males; this suggestion will be discussed later in considering territorial variations of characters.

THE RACES OF *PHYLLORHYNCHUS DECURTATUS*

A study of available *decurtatus* material indicates that this species may be divided into two well defined races based on territorial differences in several characters. One of these races inhabits the southern part of Lower California, western Sonora, and southeastern Arizona; the other is found in the

desert areas of southeastern California, southern Nevada, and western Arizona. It also certainly occurs in northeastern Lower California, although not yet reported from that area, and it will probably be found in southwestern Utah. The southerly subspecies is distinguished from the other by a lower ventral scale count, larger body blotches, darker color, and often (but not invariably) fewer blotches. These differences are subsequently discussed in detail.

However, there is some difficulty in determining to which of these two races Cope's original description applies, since the type specimen does not represent either of the extremes; rather it is intermediate in character and presumably it came from intermediate territory. Although the type specimen has been available for examination, the type locality is not known; it is given by Cope as the "upper part of Lower California" where it was collected by Wm. M. Gabb.

We know from Gabb's itinerary⁵ that he turned westward to the Pacific at Misión San Fernando, reaching the coast at Rosario; thereafter he traveled north to Tijuana either along the coast or closely adjacent thereto. *Phyllorhynchus* has never been reported from this area and from the nature of the country it may be presumed that it does not occur there. On the other hand it has been collected at San Ignacio and might be expected almost anywhere along Gabb's route as far north as Misión San Fernando. Therefore the type locality may be presumed to lie between these points; it could hardly be south of San Ignacio as it would not then have been referred to as "upper Lower California." The specimens now available from San Ignacio are not as extreme in characteristics as are those from the Cape region of Lower California; the type specimen is even less so, yet on the whole its characteristics show it to be more nearly allied to the southern than the northern race. Therefore the type subspecies is considered to be the Cape-Sonora race, while the northern form is given a new name.

⁵ Resources of the Pacific Slope, by J. ROSS BROWNE, San Francisco, 1869. Appendix: Exploration of Lower California by WM. M. GABB, pp. 82-122.

DESCRIPTIONS OF SPECIES

Because of the additional material available it is deemed advisable to present summaries of the characteristics of all forms of the genus, whether new or old.

Phyllorhynchus decurtatus decurtatus (Cope)

MEXICAN LEAF-NOSED SNAKE.

- 1868 *Phymorthyra decurtata* Cope, Proc. Acad. Nat. Sci. Phila., Nov. 1868, p. 310. Type locality, "Upper part of Lower California;" type specimen No. 5489 in collection of Acad. Nat. Sci. Phila.
- 1883 *Salvadora decurtata* Garman, Mem. Mus. Comp. Zool., Cambridge, Vol. VIII, No. 3, pp. 39, 145.
- 1890 *Phyllorhynchus decurtatus* Stejneger, Proc. U. S. National Museum, Vol. XIII, p. 154.
- 1893 *Lytorbhynchus decurtatus* Boulenger, Cat. Snakes British Museum, Vol. I, p. 417.
- 1901 *Phyllorhynchus decurtatus* (part) Brown, Proc. Acad. Nat. Sci. Phila., vol. 53, p. 64.
- 1933 *Phyllorhynchus decurtatus decurtatus* (part) Linsdale, Copeia, No. 4 of 1933, p. 222.

Material.—Six specimens from Lower California, four from Sonora, and three from southeastern Arizona; total thirteen.

Lepidosis.—Scale rows at midbody usually 19, rarely 21 or 18. The dorsal rows may be keeled or smooth; there are both territorial and sexual variations. Males are more strongly keeled than females; the latter may be quite smooth even when from areas where the males are strongly ridged. Keeling, when present, is more definite posteriorly; the neck is usually smooth even where conspicuous ridges are elsewhere present. The central dorsal row is almost invariably smooth; such keeling as may exist is most conspicuous on the three rows bordering this on either side. Territorial variations within this subspecies are as follows: Sonora males are strongly keeled, southeastern Arizona material somewhat less so; Lower California specimens are virtually smooth, whether male or female. The dorsal scales are slightly smaller than the lateral rows.

Ventrals: Males max. 168, min. 151, mean 156.7 (10 specimens); females, max. 176, min. 166, mean 171.3 (3 specimens). The anal is entire. The caudals are in two series; males, max. 35, min. 30, mean 33.5; females max. 26, min. 24, mean 25.3.

The rostral is enlarged and raised, imbricate and with grooved lateral edges. It is concave below; above it is curved backward over the snout. The internasals are small and are separated by the rostral. The prefrontals

are larger; although they are usually in contact, in one case out of the thirteen they are separated by the rostral, and in two others there is a small extra scale between them; laterally they are curved down over the sides to meet the loreals. The frontal is large and pentagonal. The supralabials are small and do not shade the eyes. The parietals are the largest of the head scales. The nasals are divided, the anterior partly roofing the nostril; the posterior is the larger. One loreal is always present; usually there is one subloreal, occasionally two, arranged horizontally; rarely there is a supraloreal. The preoculars are normally two, rarely three; postoculars usually three, sometimes two, rarely one; suboculars one to three total ocular ring seven to nine. The temporals are irregular being from 2+3 to 4+4.

The supralabials are normally six, sometimes five or seven; the last two are enlarged; usually the fourth and fifth contact the orbital scales. The infralabials are eight or nine; the initial pair is large, meeting behind the subtriangular mental. The genials, of which there is one pair, are in contact.

Form.—This is a relatively short and stubby snake. The longest available specimen, a male, is 332 mm.; the shortest 140 mm. The tail-length ratio varies from 12.7 to 16.4 per cent in the males, and from 8.3 to 9.4 in the females.

The everted hemipenis is triangular and somewhat bifurcate; the distal ends have reticulate fringes edged with points; proximally there is a transition to many short spines.

The eye is protruding, with vertical pupil; in life the iris is flecked with gray and brown. The tongue is pinkish.

Pattern and Color.—The primary pattern is a series of brown blotches on a gray-brown background. The blotches are irregular in shape, more so in the Lower California specimens than elsewhere in the range. In Sonora and Arizona they are usually elliptical, with the long axis perpendicular to the dorsal line; in Lower California they are squares or rectangles, often considerably indented and with uneven borders. The scales in the blotch centers usually themselves have light centers; thus the blotches appear to be hatched with thin longitudinal lines. The blotches at midbody are from 2½ to 6 scales (end to end) long and seven to eleven scale-rows wide. Longitudinally they are greater than the interspaces. The blotches are somewhat darker anteriorly and on the neck there is frequently a particularly dark blotch of double length. On the sides there are one or more auxiliary series of spots, irregular in form, which may be the same or double the frequency of the main series. In some specimens, notably those from Sonora, these secondaries coalesce on the neck to form short longitudinal side bands. Between the blotches the ground color is heavily punctated with gray or brown, except for the mid-dorsal rows which are clearer and lighter. The dorsal ground-color is light brown or tan in life,

but grayish-white when preserved. The undersurfaces are immaculate, white or cream.

The head is marked with a cross band across the prefrontals which passes downward and backward through the eye to the commissure. This band is perfect in some specimens (particularly those from Arizona), less so in others. On the parietals there are usually several small brown spots.

The body blotches vary in number from 20 to 42, the average for 13 specimens being 31.0. The Cape specimens have the fewest blotches (3 specimens have 20, 24, and 25) followed by those from Sonora. There is considerable irregularity in the blotch count as in some specimens a secondary series, almost equaling the primary in size, practically doubles the count. The blotches on the tail vary from 4 to 8, average 6.1.

Range.—Specimens have been collected in the following localities:

LOWER CALIFORNIA:

“Upper Part of Lower California” (Type Locality)

San Ignacio

Bet. Loreto and Comondu

La Paz

SONORA:

La Posa near San Carlos Bay, Guaymas

San Carlos Bay, Guaymas

Alamo Muerto, 30 mi. W. of Caborca

ARIZONA:

Tucson, Pima County

San Xavier Mission, Pima County

Coolidge, Pinal County

***Phyllorhynchus decurtatus perkinsi*⁶ Subsp. nov.**

DESERT LEAF-NOSED SNAKE.

1901 *Phyllorhynchus decurtatus* (part) Brown, Proc. Acad. Nat. Sci. Phila., Vol. 53, p. 64.

1933 *Phyllorhynchus decurtatus decurtatus* (part) Linsdale, Copeia, No. 4 of 1933, p. 222.

Type.—No. 23757 in the collection of L. M. K. Collected at Dry Lake,⁷ San Diego County, California, by L. M. K., May 4, 1935.

⁶ Named for my good friend C. B. PERKINS, in charge of reptiles at the Zoological Society of San Diego, who has been the source of much useful material, including an unprecedented series of rattlesnakes from Colorado.

⁷ Dry Lake is on the Narrows to Kane Springs road, 3 mi. west of the Imperial County line. It is a flat, but not especially sandy desert. The following paratypes are available from the same point: LMK 22260-1, 22295, 22297-8, 22741, 22954-5, 23027, 23386-7, 23750-6, 23758-61, 23815, 23846-8, 23911-3, 23918-23, 23951, 23995-7; total 39.

Diagnosis.—A subspecies of *Phyllorhynchus decurtatus* characterized by a high ventral scale count and small, widely separated body blotches.

*Description of the Type.*⁵—Adult male. Length overall (prior to setting in preservative) 441 mm.; length of tail 67 mm.; ratio of tail to total length 15.2 per cent.

The scale rows are 21-19-17. The seven dorsal rows are keeled; the keeling virtually disappears on the neck, first failing on the mid-dorsal row. The ventrals number 176; the anal is entire; the caudals number 39 and are in two series.

The rostral is enlarged and prominent, as is typical of the genus; it is concave below and curved backward over the snout above. There is a pair of internasals, which are separated by the rostral; a pair of prefrontals in contact, followed by a large frontal, bordered by a small supraocular on each side. Then follows a pair of parietals, the largest of the head shields. The nasals are divided into two parts, the posterior larger. There is a loreal and subloreal on each side. There are two preoculars, two postoculars, and two suboculars, making the ocular rings 7. The temporals are 3+4, 2+4. The supralabials are 6—6, the last two being the largest; the infralabials are 9—8, the first two meeting on the median line; of the others the fifth on the right and fourth on the left are largest. The mental is triangular and strongly concave on the sides. There is a single pair of genials in contact. There are five scales between the genials and first ventrals.

The ground color of the body is straw-white (vinaceous in life) upon which there is superimposed a series of 37 rectangular brown spots about 1½ scales long (end to end) and five scale-rows wide. The inter-blotch spaces are four or five scales long (end to end). On the sides there are two series of small spots somewhat irregularly dispersed. There are five blotches on the tail; others toward the tip are obsolete. On the dorsum (between blotches) 13 scale rows are punctated with brown, the mid-dorsal rows somewhat less than those on the sides. The scales constituting the dorsal blotches have light centers. The ventrals and first three lateral rows are white. The head is somewhat punctate. From each eye there is a short diagonal brown mark passing downward and backward between the fifth and sixth supralabials.

GENERAL SUMMARY OF PERKINSI

Material.—The following will summarize the variations of *perkinsi* based on 151 specimens, 12 from Arizona, one from Nevada, and the balance from California, of which 40 are from the type locality. A number of other specimens have been seen alive.

Lepidosis.—The scale rows at midbody are normally 19, a single speci-

⁵ Purposely made brief to avoid duplication with the general summary of *perkinsi* subsequently given.

men having 18. The complete scale row formula is usually 21-IV-19-III-17. There is considerable variability on the neck, the 21 section being generally short, or it may be absent; sometimes there are 23 rows at this point. The second condensation (from 19 to 17) seems always present; it may occur slightly posterior to midbody, or nearer to the tail. Rarely there is a reduction to 15 at this point. The dorsal scales are usually smooth anteriorly, but may be keeled posteriorly, especially in the adult males. The dorsal scales are slightly smaller than the lateral rows. Ventrals: Males, max. 183, min. 166, av. 173.9 (91 specimens); females, max. 194, min. 181, av. 188.0 (52 specimens). It will be seen that sexual dimorphism is extensive; were it not for a single male from Yuma with 183 ventrals there would be no overlapping, for the next highest has 180. The anal is entire. Caudals: Males, max. 41, min. 32, av. 37.2 (90 specimens); females, max. 32, min. 26, av. 29.1 (52 specimens). The caudals are divided.

The rostral (the most conspicuous characteristic of the genus) is greatly enlarged, with overhanging and grooved lateral borders. Below it is strongly concave; above it is recurved so as to separate the internasals, and partly divide the prefrontals. The internasals are small; the prefrontals are moderate in size and curve downward over the sides toward the loreals. In one specimen the prefrontals are split longitudinally. The frontal is large and pentagonal. The supralabials are small and not imbricate over the eyes. The paired parietals are the largest of the head scales; they may be bordered posteriorly by a few enlarged scales; in one specimen they are fused posteriorly. The nasals are divided, the posterior being larger and higher. A true loreal of moderate size is always present; in addition there is usually at least one subloreal, or more often two (arranged horizontally). Sometimes there is a supraloreal, split from the top of the true loreal. Thus the loreals are one in 10 per cent of the cases, two in 70 per cent, three in 17 per cent, and four in 3 per cent. The preoculars are normally two; there are three in 8 per cent of the specimens and one in 1 per cent. The postoculars are usually two; occasionally three (5 per cent), or one (4 per cent). In three cases the postoculars are fused to the supraoculars, in one specimen to the parietals. Suboculars vary from one to four, the distribution in per cent being as follows: one (1), two (48), three (50), four (1). Thus the orbital ring, while normally 7, is often 8, occasionally 9, rarely 6, and in one case 5. The temporals are highly variable; while often 2+3 or 3+3, the first row may number as many as 5 and the second as high as 6.

The supralabials are normally six (83 per cent); occasionally seven (16 per cent), rarely five (1 per cent). Ordinarily the last two are the largest; when there are six the fourth and fifth contact the orbital scales. The infralabials vary from seven to ten, the distribution being as follows in per cent; seven (4), eight (43), nine (51), ten (2). The initial pair is large; they meet behind the mental which is deeply indented on the sides. Of the others any from the second to the fifth may be the largest.

There is a single pair of genials in contact; the next posterior pair of scales are often considerably enlarged and are usually separated by a scale. There are from 3 to 6 scales between genials and ventrals; usually 5.

Form.—*Phyllorhynchus decurtatus perkinsi* is a small snake, rather stubby and cylindrical in form, with a blunt tail. The head is slightly distinct from the neck; it represents about 3.3 per cent of the length overall. The longest specimen recorded (a male) is 485 mm. (19.1 in.) overall; the shortest 165 mm. (6.5 in.). Specimens exceeding 450 mm. are not unusual in San Diego County. Males reach a slightly greater length than females. There is a considerable sexual dimorphism in tail length; in the males the tail is from 11.2 to 16.3 (average in 88 specimens 14.3) per cent of the length of the body overall; in the females the corresponding figures are 8.0 to 10.8 (average in 50 specimens 9.6 per cent.)⁹

The everted hemipenis is triangular, being wide distally. Although there is a deep vertical groove on each side the organ is only slightly bifurcate with sulcus divided distally. At the top there are transverse striations. These merge on the sides into fringes, reticulate and edged with points; proximally there is a gradual transition to many short, heavy spines, closely and evenly distributed. This transition seem to be more gradual than in *d. decurtatus* or *browni* and the proximal spines proportionately heavier in *perkinsi*.

In life the eye is protruding, the iris flecked with gray and with brown near the vertical pupil. The pupil is held vertical regardless of the angle of the head. The expansion of the pupil in darkness is both vertical and horizontal, but the latter predominates. The two eyes seem to have considerable independence of action in rotary motion. The tongue is white at the tip, otherwise pinkish.

Pattern and Color.—*Perkinsi* is quite variable in both pattern and color. The former consists essentially of a series of squarish or rectangular dorsal spots of brown to the number of from 24 to 48 (males average 34.7, females 38.0, both sexes 35.9). The spots are often in the form of short cross-rectangles, with the edges indented on the central dorsal line. Usually they extend from 1½ or 2 scales end-to-end, laterally covering

⁹ The variation within each sex is partly the result of the fact that sexual dimorphism in this character increases with age, a condition which I have found to exist in other genera as well. The relation between tail length and body length is linear but with a constant term; in *P. decurtatus* it approximates, for the males, $T=0.174L-11.2$; and for the females $T=0.103L-2.4$, both T , the tail length, and L , the length overall, being expressed in millimeters. Hence, taking snakes 200 and 400 mm. in length, we find that in the males the tail ratio increases (in passing from the juvenile to adult stage) from 11.8 to 14.6 per cent, while in the females the increase is from 9.0 to 9.7 per cent, thus showing the effect of the male organs contained in the tail. There is virtually no overlap in the T/L ratio, if size be taken into consideration, although adult females closely approach some juvenile males in this characteristic. These determinations were largely made on fresh specimens prior to the shrinkage resulting from setting in preservative, which shrinkage affects the tail and body differently.

from 5 to 7, rarely 9, central dorsal rows. The separation is generally greater than the spot width. The dark scales comprising the spots usually have light centers.

In addition to the main dorsal series there is at least one and often two or three secondary series of smaller spots on the sides. These are rather irregular in disposition; they may be of the same or double the frequency of the main series. In one specimen the main dorsal series is absent, but the auxiliary series is clearly evident. On the tail there are from 2 to 9 spots; these often cannot be counted with accuracy as they fade out toward the tail-tip.

In addition to these spots the sides above the second or third row, and, less often, the central dorsal area as well, are stippled with brown, sometimes so thickly and darkly as to render the dorsal series of blotches inconspicuous. The ground color, dorsally, is pinkish or vinaceous in life; in preservative this fades to a dirty white. This is a true color, not the result of translucence of the skin, as can be clearly seen in life along its lower borders, where it is often patchy, or on the tail where less complicated by darker punctations.

The head is irregularly spotted. Often the only mark is a broken brown band across the anterior part of the frontal, thence passing downward and backward across the eyes to the supralabials. This is generally less distinct and regular than in *browni* or *decurtatus decurtatus*; it is more prominent in the Mohave than in the Colorado Desert specimens; often it is entirely absent.

Live specimens of *perkinsi* from the type locality in San Diego County have the following coloration: Head Pale Grayish Vinaceous¹⁰ with a few scattered Sorghum Brown Spots; dorsal blotches Sorghum Brown with somewhat lighter centers; dorsal area between blotches Vinaceous Pink, lateral areas Vinaceous Buff; lower lateral areas and ventral surface White.

Range.—*Perkinsi* is widespread throughout the deserts of the southwest, as is indicated by the following locality records:

CALIFORNIA:

SAN DIEGO COUNTY:

Dry Lake (Type Locality)¹¹
Sentenac Canyon
Yaqui Well

The Narrows
Borego Valley
San Felipe
La Puerta
N. end of Borego Mt.

¹⁰ Capitalized colors refer to Ridgway, Color Standards and Nomenclature, 1912.

¹¹ Actually, specimens have been collected in every one of the 20 miles on the highway from Sentenac Canyon via Yaqui Well, The Narrows, and Dry Lake to the County Line, but only these named points are listed, the specimens having been allocated to the nearest.

IMPERIAL COUNTY:

Mountain Springs
 Myers' Creek Bridge (on
 U.S. 80)
 Plaster City
 Kane Spring
 9, 12 mi. NW. of Kane
 Spring
 28 mi. SE. of Oasis
 Arroyo Salada Bridge (on
 U.S. 99)
 Bailey's Well
 Near Brawley
 4 mi. W. of Midway Well
 Bet. Gray's and Midway
 Well
 10 mi. W. of Yuma
 Pilot Knob
 Araz
 Andrade

RIVERSIDE COUNTY:

Tahquitz Creek
 Bet. Cabazon and Palm
 Springs
 Palm Springs
 10 mi. SE. of Palm Springs
 Indian Wells
 Cathedral City
 3 mi. S. of Coachella
 Travertine Rock
 Desert Center
 14 mi. W. of Blythe

SAN BERNARDINO COUNTY:

3½ mi. E. of Summit
 Near Victorville
 Bryman
 Helendale
 Barstow
 Nebo

Gale
 Newberry Springs
 Troy
 Argos
 Ash Hill
 2 mi. W. of Topock
 Bridge
 3, 6 mi. S. of Needles
 Goffs
 Twentynine Palms

KERN COUNTY:

Inyokern

INYO COUNTY:

Mesquite Spring
 Panamint Mts. vic. of
 Goler Canyon

NEVADA:

CLARK COUNTY:

5 mi. SW. of Glendale
 10, 15 mi. SE. of Las Vegas

ARIZONA:

YUMA COUNTY:

Yuma
 Ligurta
 Adonde
 8 mi. W. of Wellton
 Tacna
 Colfred

MOJAVE COUNTY:

Kingman
 McConnico
 7, 10 mi. SW. of Oatman

MARICOPA COUNTY:

NW. of Wickenburg at
 Yavapai Co. line (*De-
 curtatus-perkinsi* inter-
 grade)

Phyllorhynchus browni Stejneger

PIMA LEAF-NOSED SNAKE.

- 1890 *Phyllorhynchus browni* Stejneger, Proc. U. S. National Museum, Vol. XIII, p. 152. Type locality, Tucson, Arizona; type specimen, USNM No. 15719.
- 1893 *Lytorhynchus brownii* Boulenger, Cat. Snakes British Museum, Vol. I, p. 417.
- 1933 *Phyllorhynchus decurtatus browni* Linsdale, Copeia, No. 4 of 1933, p. 222.

Lepidosis.—Scale rows 21-19-17, the first row dropped being the fourth, the second, the third. The 21 and 17 sections are short, the first on the neck, the other anterior to the vent. The dorsal scales are smooth anteriorly, and are usually keeled at midbody and tail (only males examined). The ventral scales vary from 156 to 172; average for 8 specimens 160.1. These are all males; from analogy with *perkinsi* it may be anticipated that the female counts will be considerably higher. The anal plate is entire. The caudals, which are divided, vary from 30 to 40; average 32.6.

The rostral is large and conspicuous; it is raised and with free borders. Below it is concave; above recurved, separating the internasals, and, anteriorly, the prefrontals. The internasals are small; the prefrontals somewhat larger and curved over the sides. In one specimen there is an extra scale between the prefrontals. The supraoculars do not jut over the eyes; they are separated by a large pentagonal frontal. The parietals are the largest of the head scales. The nasals are divided. The loreals number from one to four, there being usually at least one subloreal present. There are two or three preoculars, two to four postoculars, and two or three suboculars; thus the ocular ring varies from seven to ten. The temporals may be 2+3, 2+4, 3+3, or 3+4. The supralabials are normally six but occasionally seven; the infralabials eight or nine. Of the supralabials the last two are the largest. The first infralabials meet on the median line; the mental is subtriangular and indented laterally. There is a single pair of genials.

Form.—*Browni* is a small, stubby snake with a blunt tail, and with head only slightly distinct from the neck. The longest specimen measured was 345 mm. (13.6 in.), the shortest 166 mm. (6.5 in.). The tail length ratio (all specimens males) varies from 10.8 to 13.6 per cent (average 13.0). The tail may not be quite complete in the specimen having the lowest ratio.

The hemipenis is somewhat bifurcate; on the distal ends the fringes are reticulate and edged with points, while proximally there is a gradual transition to many short heavy spines, evenly spaced. The spines may be, proportionately, slightly smaller and thinner than in *perkinsi*, but the limited material makes this uncertain.

The pupil of the eye is vertically elliptical.

Pattern and Color.—The pattern of *browni* consists of a series (11 to 13, average 12.1) of red-brown, dorsal blotches. These are even-edged and in strong contrast with the ground color, much more so than in *decurtatus*. They are rather variable in shape; they may be circular or elliptical, and, if the latter, usually have the long axis longitudinal, but occasionally transverse. Some are dumb-bell shaped. Often the largest blotches have light centers. There are from two to four additional blotches on the tail. The ground color is white or cream in preservative. The ventral surface is immaculate.

Usually the dorsal blotches extend to the third or fourth lateral scale-rows. The area between the blotches is generally punctated, particularly on the sides. Rarely a secondary series of small spots is faintly in evidence on the lowest side rows. On the head the only mark is a brown crescent crossing the frontal, and extending backward across each eye to the angle of the mouth.

A live *browni* from Sabino Canyon, was colored as follows: Centers of dorsal blotches Fawn, outer edge Light Seal Brown; mid-dorsal inter-blotch areas Vinaceous Buff, laterally speckled with Fawn; lower lateral areas and ventral surface White. (Capitalized colors refer to Ridgway.)

Range.—Thus far *browni* has been taken only at Tucson, (the type locality), San Xavier Mission, and Sabino Canyon (Santa Catalina Mountains), Pima County; and near Desert Wells (11 mi. E. of Mesa), Maricopa County, Arizona. A snake reported from Granite Gap, Hidalgo County, New Mexico,¹² was probably of this species, but was not definitely identified.

DISCUSSION OF SPECIES DIFFERENCES

The difference between *browni* and *decurtatus* is exclusively one of pattern; in all other particulars the relationship is obvious and close. As the two forms occupy the same territory and ecological niches they cannot be separate subspecies—they are either full species or identical.

The pattern differences, consisting of a wide separation in the number of body blotches (range 11-13 in *browni*, 20-48 in *decurtatus*, corresponding averages 12.1 and 35.6), the nature of the blotches, and the virtual lack of secondaries in *browni*, are conspicuous and definite. Yet against this there are certain considerations which must not be overlooked:

1. *Decurtatus* from *browni* territory exhibits the

¹² MEDDEN, Copeia, 1927, No. 64, p. 82.

same scale characteristics as *browni*, i.e., the ventrals are fewer than in *decurtatus* elsewhere, the caudals are fewer, an inter-prefrontal scale is occasionally present. The diagonal stripe on the head is particularly conspicuous on *browni* and more so in *decurtatus* from southeastern Arizona than in the latter species from other areas. The amount of keeling is about the same in the two forms from the Tucson area.

2. The single specimen of *browni* from beyond the immediate vicinity of Tucson presents the same increasing tendency in scale counts as is shown territorially by *decurtatus*; that is, an increase from Tucson toward western Arizona. This specimen, taken by Earl Sanders not far from Mesa, Arizona, has 172 ventrals and 40 caudals, compared with a maximum of 160 and 33 in the Tucson group (all males). The blotches are smaller and darker in color than those from around Tucson, but in number and shape of blotches this specimen is just as distinctive as the others.

3. All of the eight available specimens of *browni* are males; thus the distinctive pattern may be a sexual character. However, this preponderance is not so remarkable in view of the fact that ten of the thirteen specimens of *decurtatus decurtatus* are males, and of 150 specimens of *perkinsi* two-thirds are males. The theory that the *browni* form might be a manifestation of sexual dimorphism was canvassed by Schmidt in 1922. He concluded that this was impossible, since USNM 62561 was reported by Stejneger to be a female. I have re-examined this specimen and it appears to me to be a male, as is also indicated by the low ventral scale count. Thus all eight known specimens of *browni* are apparently males.

The problem is somewhat analagous to that of *Lampropeltis getulus boylii* and *L. californiae*. Just as *L. californiae* is found in only a small part of *L. g. boylii* territory, so also *browni* is much more restricted than *decurtatus*. No *browni*-

decurtatus mixtures have yet come to light, while *boylli-californiae* intergrades are not uncommon.

Upon the evidence thus far available we conclude that *browni* and *decurtatus* are distinct species.

THE VALIDITY OF PERKINSI

In segregating the two subspecies of *decurtatus* it becomes important to determine the consistency of the characters upon which the segregation is predicated.

As a basis upon which to build we shall take *perkinsi* as found in California. This group is selected because it seems homogeneous and is the only territorial form available in sufficient numbers to permit the necessary computations.

The most important diagnostic characters are ventrals, body blotches, and pattern. In these the California specimens appear quite consistent; only the eastern San Bernardino County specimens show a slight tendency toward the reduction in ventrals which is characteristic of the northwestern Arizona specimens. Summarizing the California specimens, of which there are 82 males and 53 females, we have the following statistics:

CALIFORNIA PERKINSI

	<i>Ventrals</i>		<i>Body Spots</i>	
	<i>Males</i>	<i>Females</i>	<i>Males</i>	<i>Females</i>
Extreme range	167-180	181-194	24-46	30-48
Interquartile range	172.1-176.5	186.1-190.2	31.9-37.8	35.0-40.9
Mean	174.3	188.2	34.8	37.9
Probable error of				
the mean	±0.25	±0.29	±0.32	±0.32
Coefficient of variation				
(per cent)	1.9	1.6	12.5	11.4

Thus we find the variation of the ventrals to be quite restricted. There is no overlap between the sexes. The adherence to the normal curve is not particularly close but this is probably a result of the relatively few specimens available and the large territory covered; rattlesnake studies indicate that the ventrals in a homogeneous and territorially restricted group closely approach a normal distribution.

The blotches have a wider dispersion; the curve is skewed, not normal, with a tail toward the higher numbers. This peculiar distribution results from the fact that between the main dorsal blotches there is a secondary series which sometimes intersperses spots of equal size and quality with the primary series, especially on the neck, and when this is the case the normal series of about 35 blotches is increased into the forties. As the curve is skewed the interquartile range cannot be considered accurate.

The western Arizona *perkinsi* differ somewhat, but not conspicuously, from the California specimens. Here we find that ten males have an average ventral count of 171.1 and the single female 189. The corresponding body spot averages are 34.3 and 41.0. Hence we see that these Arizona specimens fall about 3 or 4 below the California average in ventrals; there is no essential deviation in the body spots. The western Arizona specimens thus are more closely allied to the California form (*perkinsi*) than to the southeastern Arizona *decurtatus decurtatus*.

The differences between *decurtatus* and *perkinsi* are more definite and extensive. We have the following:

	<i>Decurtatus</i> (Lower Calif., Sonora, SE. Arizona)	<i>Perkinsi</i> (California, W. Arizona)
Ventrals		
Males, range	151-168	166-183
Males, average	156.7	173.9
Females, range	166-176	181-194
Females, average	171.3	188.0
Caudals		
Males, range	30-35	32-41
Males, average	33.5	37.2
Females, range	24-26	26-32
Females, average	25.3	29.1

Thus the average difference in the ventrals is about 10 per cent, which is highly significant where the coefficient of variation in one of the forms is about 2 per cent.

In pattern the conspicuous difference between the two forms is in the comparatively larger blotches in *decurtatus*

decurtatus with proportionately reduced interspaces; also the typical form is usually darker in life.

Certainly subspecific differentiation between these two forms is warranted.

A specimen from a few miles north of Wickenburg, Maricopa County, Arizona, near the Yavapai County line, taken by Earl Sanders, has 164 ventrals and the dorsal blotches are about equal to the interspaces. Thus it falls between typical *decurtatus* and *perkinsi* and may be taken as indicating an area of intergradation between the two forms, which should extend from this point southward into Sonora. Another area of intergradation is to be expected on the east coast of north-central Lower California.

In this species, as in certain other genera, as for instance *Lichanura*, *Tantilla*, and *Trimorphodon*, we observe that Arizona (particularly southeastern Arizona) specimens are more closely allied with southern Lower California individuals than with those from California. Furthermore we find, as is often the case, that the Mohave Desert specimens are closer to those of Arizona and Lower California than the Colorado Desert specimens, for in *perkinsi* the Mohave snakes are likely to have larger blotches than have those from San Diego and Imperial Counties; also they are more heavily punctated.

Within *decurtatus decurtatus* the principal territorial variations are in scales and pattern. Sonora males are strongly keeled while those from Lower California are smooth or nearly so. Also the former tend toward close-set, even, elliptical blotches, while the latter generally have square marks with highly irregular boundaries. However, for the present it appears inadvisable to make a further separation into three subspecies, for the Sonora-Lower California differences are not substantiated by differences in ventral scale counts, as is the case between *d. decurtatus* and *d. perkinsi*. Additional material in the future may indicate the desirability of a further subspecific division between the Lower California specimens on the one hand and those from Sonora and southeastern Arizona on the other.

THE HABITS OF THE LEAF-NOSED SNAKE

The following notes, while largely based on specimens of *perkinsi*, are probably equally applicable to the other forms and in a few instances are based on them.

Most of the early specimens of *decurtatus* or *perkinsi* were collected by overturning stones or fallen cacti. Thus up to 1922, only 6 specimens had come to light. Now, with the new technique of night collecting of desert snakes by auto, it is not unusual to secure three or more specimens in an evening and on one occasion no less than 12 specimens (6 alive and 6 run over) were collected by two automobiles working the same territory between 7:30 and midnight; one week later (June 1) a single auto collected 9.

These snakes are not as subterranean as are, for instance, *Leptotyphlops* and *Anniella*; they are merely nocturnal and it is only necessary to look for them against a background where they can be readily detected. Thus, if one drives slowly along an oiled or paved desert road at night, all of the desert snakes, being light in color, stand out brilliantly in the glare of the headlights as they cross the highway. This collecting method is found more fruitful than the laborious plan of working cross-country with a hand flash-lamp, owing to the far greater territory covered by motor and the difficulty of discovering the spotted desert forms in their normal habitat where stones and twigs abound. I have not yet had the opportunity to try the auto scheme in *brownii* territory.

Just as the coastal diurnal snakes are most easily taken in spring, so it appears that the desert nocturnal snakes are most active in the same season. There are also indications (not yet definitely verified) that the dark of the moon is preferable and that the early evening (say 7:30 to 9 p. m.) is a better time to collect than later. However, they have been taken as late as 2:30 a. m. I have never found *Phyllorhynchus* abroad before dark as is occasionally the case with such desert night snakes as *Arizona elegans occidentalis* or *Sonora occipitalis*; I have even found the latter active before sunset, although this is quite exceptional.

One evening in early June we collected 9 specimens of *perkinsi* between 7:30 and 11:10; the temperature was from 83° to 86° F. Three days later the temperature had risen to 116° in the daytime and about 93° to 95° at night and leaf-nosed snakes were distinctly scarcer, although not entirely absent. While *Phyllorhynchus* is a desert denizen it cannot endure a temperature of 115° F. even when kept in the shade. These snakes must therefore seek refuge in deep rodent holes in the daytime, since they could hardly burrow deeply enough to protect themselves from the terrific surface heat, especially as they are not restricted to areas of loose sand.

It would seem that *perkinsi* is more plentiful in some sections of the desert than in others of similar characteristics, at least we have had more luck finding them in certain places. At such points they are the most common snake; at others they are probably exceeded by *Sonora occipitalis*, *Arizona elegans occidentalis*, and *Crotalus cerastes*. They are absent or rare in the irrigated sections of the desert, such as the fields of the Coachella and Imperial Valleys, thus indicating a preference for the original arid conditions. While apparently preferring habitats where there is some sand they are found in rocky situations as well, as, for instance, at various points on the desert slope of the mountains in San Diego County. Thus *Phyllorhynchus decurtatus* has a wider range than *Crotalus cerastes*, the most highly specialized of the desert snakes. I have not collected *perkinsi* in the belt of sand hills (about 3 mi. wide) west of Yuma, where both *S. occipitalis* and *C. cerastes* are found; probably it does not prefer an all-sand habitat.

In captivity the leaf-nosed snake usually burrows in sand or hides under debris. While the exaggerated nose-shield is undoubtedly of advantage in burrowing it probably is not entirely the result of a burrowing habit. *Salvadora* has a similar rostral and does not seem to be a burrower. Certainly the reinforced, but blunt, rostral of *Phyllorhynchus* is not to be compared in effectiveness of adaptation with the shovel-shaped and overhanging snouts of *Sonora occipitalis* or *Chilomeniscus cinctus*; the latter go into sand seemingly without

effort, but *Phyllorhynchus* must press the sand out of the way with side-movements of the head. It usually takes from one to two minutes to bury itself, as it pauses several times en route. *S. occipitalis* and *C. cinctus* go in considerably faster. In captivity *P. d. perkinsi* spends less time buried in sand than *S. occipitalis* or *C. cinctus*; nevertheless it will often remain under sand in the daytime and seems to be entirely comfortable when buried to a depth of several inches. It does not have the habit, so often seen in *S. occipitalis* and especially *C. cinctus*, of lying in the sand with snout and eyes exposed for observation. A specimen of *P. d. decurtatus* from San Ignacio seemed to spend more time above ground than *P. d. perkinsi* from the Colorado desert.

Dr. E. H. Taylor has collected specimens of *decurtatus decurtatus* at night on the beach of San Carlos Bay near Guaymas. Another was found crawling on a wet flat after a rain.

Phyllorhynchus defends itself by assuming a striking coil with retracted neck and head. It lunges forward with a slight hiss and sometimes opens the mouth when striking. Probably its worst enemy, since they are active at the same time and inhabit the same localities, is *Arizona elegans occidentalis*, which is known to feed upon it, as well as on other snakes, lizards, and mammals.

Little is known concerning the food habits of the leaf-nosed snakes. Presumably they eat insects and lizards; but in the spring they seem to feed largely on lizard eggs, especially those of *Coleonyx variegatus*. Thus of 11 specimens in one lot, collected in late May, 5 contained lizard eggs. One contained 11 such eggs in all stages of digestion from the full egg to the folded empty sheath about to be excreted. A young adult specimen of *perkinsi*, when placed in a bag with several *Coleonyx variegatus* ate the tails off of two. The tails had not previously been dropped, thus indicating that the snake must have seized them with the usual result. The lizards were too large to have been eaten entirely, although a large leaf-nosed snake could easily eat a small gecko and has been observed to do so in captivity. Out of 21

geckos caught one night 5 had recently lost their tails, no doubt partly the result of leaf-nosed attacks. In captivity the leaf-nosed snake drinks water readily, although it can rarely have access to water in the wild.

Phyllorhynchus usually lays from 2 to 4 eggs (7 individuals noted with 4 eggs, 2 with 3, 1 with 2). The eggs of two specimens were measured; the first, 428 mm. over all contained 3 eggs about 10x35 mm.; the second, 327 mm. long contained 2 eggs, 8x37 mm. The eggs seem very large proportionate to the size of the snake.

Specimens of the leaf-nosed snake have been found with the vermilion colored mites which afflict many of our southwestern reptiles.

ACKNOWLEDGMENTS

I wish to thank the following individuals and institutions for the loan or gift of useful material:

Drs. L. Stejneger and Doris M. Cochran, U. S. National Museum; Mr. J. R. Slevin, California Academy of Sciences; Dr. G. K. Noble, American Museum of Natural History; Drs. Jos. Grinnel and Jean Linsdale of the Museum of Vertebrate Zoology, University of California; Drs. R. B. Cowles and Walter Mosauer, and Mr. Chas. M. Bogert, University of California at Los Angeles; Drs. Witmer Stone and H. W. Fowler, Academy of Natural Sciences of Philadelphia; Dr. A. H. Wright, Cornell University; Dr. E. H. Taylor, University of Kansas; Mr. H. R. Hill, Los Angeles Museum; Mrs. Helen T. Gaige and Mr. H. K. Gloyd, University of Michigan; the late Mr. A. H. Schlanze, Andrade, California; Messrs. Earl Sanders and R. E. Love, Mesa, Arizona; Mrs. Belle Benchley and Mr. C. B. Perkins, San Diego Zoological Society; Mr. David Regnery, San Diego; Mr. E. E. Benson, Dry Lake. Mr. L. H. Cook has been of much assistance to me in the making of scale counts.

SUMMARY AND KEY

Phyllorhynchus decurtatus and *P. browni* are distinct species having overlapping ranges; their principal difference is in body pattern. *P. decurtatus perkinsi* is described as a new subspecies from California, western Arizona and southern Nevada; it differs from the typical form as found in southern Lower California, Sonora, and southeastern Arizona in having a greater number of ventral and caudal scales, and smaller, more widely separated blotches.

- A. Dorsal body blotches (not including tail) less than 16 *Phyllorhynchus browni*
(Pima and Maricopa Counties, Arizona; probably also southwestern New Mexico.)
- AA. Dorsal body blotches more than 18.....
..... *Phyllorhynchus decurtatus*
- B. Ventrals usually number less than 167 in males and 179 in females; body blotches wider (along dorsal line) than interspaces.....*P. d. decurtatus*
(Central and southern Lower California; western Sonora; south-central Arizona.)
- BB. Ventrals usually number more than 167 in males and 179 in females; body blotches narrower (along dorsal line) than interspaces..... *P. d. perkinsi*
(Desert and arid sections of California east of the Sierras and San Jacintos from the Death Valley region southward; northeastern Lower California; southern Nevada; western Arizona.)

ANNOTATED BIBLIOGRAPHY

ATSATT, SARAH R.

- 1921 A snake New to California. *Copeia*, No. 96, pp. 38-39.
Announcement of the first California specimen.
- 1923 Behavior of the Leaf-nosed Snake, *Phyllorhynchus decurtatus*.
Univ. of Calif. Pubs. in Zool., Vol. 21, No. 9, pp. 303-312.
Extensive observations on the first California specimen in
captivity.

BROWN, A. E.

- 1901 A Review of the Genera and Species of American Snakes North
of Mexico. *Proc. Acad. Nat. Sci. Phila.*, Vol. 53, pp. 10-110.
Description of the first specimen of *decurtatus* reported from
the United States (pp. 64-65).

COPE, E. D.

- 1868 Sixth Contribution to the Herpetology of Tropical America.
Proc. Acad. Nat. Sci. Phila., 1868, pp. 305-312.
Original description of the first *Phyllorhynchus* discovered.
P. decurtatus described as *Phimothyra decurtata* (p. 310).
- 1900 The Crocodilians, Lizards, and Snakes of North America. *Ann.*
Rept. U. S. Nat. Mus., 1898, pp. 153-1294.
Descriptive summary (pp. 821-824).

KLAUBER, L. M.

- 1924 Notes on the Distribution of Snakes in San Diego County, Cali-
fornia. *Bull. Zool. Soc. of San Diego*, No. 1, pp. 1-23.
The second California specimen (p. 11).
- 1931 A Statistical Survey of the Snakes of the Southern border of
California. *Bull. Zool. Soc. of San Diego*, No. 8, pp. 1-93.
Range and habitat.
- 1932 Amphibians and Reptiles Observed Enroute to Hoover Dam.
Copeia, No. 3 of 1932, pp. 118-128.
Decurtatus in Nevada (p. 125).

LINSDALE, J. M.

- 1933 The Leaf-nosed Snake in Sonora, Mexico. *Copeia*, No. 4 of 1933,
pp. 222-223.
Occurrence of *decurtatus* in Sonora and suggestion that *browni*
is a subspecies of *decurtatus*.

MEDDEN, RHENA V.

- 1927 Notes on *Phyllorhynchus*. *Copeia*, No. 164, pp. 82-83.
A specimen of *decurtatus* from California and probable occur-
rence of *browni* in New Mexico.

MOSAUER, W.

- 1932 Adaptive Convergence in the Sand Reptiles of the Sahara and of California: A Study in Structure and Behavior. *Copeia*, No. 2 of 1932, pp. 72-78.

Character of nostril.

ORTENBURGER, A. I. and ORTENBURGER, R. D.

- 1926 Field observations on some Amphibians and Reptiles of Pima County, Arizona. *Proc. Okla. Acad. of Sci.*, Vol. 6, pp. 101-121.

Capture of a specimen of *browni* (p. 116).

SCHMIDT, K. P.

- 1922 The Amphibians and Reptiles of Lower California and the Neighboring Islands. *Bull. Am. Mus. Nat. Hist.*, Vol. 46, pp. 607-707.

Discussion of differences between *browni* and *decurtatus* (pp. 685-687).

SLEVIN, J. R.

- 1931 Range Extensions of Certain Western Species of Reptiles and Amphibians. *Copeia*, No. 3 of 1931, pp. 140-141.

Decurtatus in Inyo County, a new northern record.

STEJNEGER, L.

- 1890 On a New Genus and Species of Colubrine Snakes from North America. *Proc. U. S. Nat. Mus.*, Vol. 13, pp. 151-155.

Original descriptions of the genus *Phyllorhynchus* and the species *P. browni*.

VAN DENBURGH, J.

- 1922 The Reptiles of Western North America. *Occ. Papers Cal. Acad. of Sci.*, No. 10, pp. 1-1028 (2 vols.).

Complete descriptions (pp. 692-697).

VORHIES, CHAS. T.

- 1926 Notes on Some Uncommon Snakes of Southern Arizona. *Copeia*, No. 157, pp. 158-160.

Notes on two specimens of *browni*.

EXPLANATION OF FIGURES

FIG. 1. *Phyllorhynchus decurtatus decurtatus*, Mexican Leaf-nosed Snake.

Adult male collected by Dr. Walter Mosauer at San Ignacio,
Lower California, Mexico.

FIG. 2. *Phyllorhynchus decurtatus perkinsi*, Desert Leaf-nosed Snake.

Adult male collected by L. M. Klauber at Dry Lake, San Diego
County, California.

FIG. 3. *Phyllorhynchus browni*, Pima Leaf-nosed Snake.

Adult male collected by Earl Sanders near Desert Wells,
Maricopa County, Arizona. (Photograph by courtesy of H. K.
Gloyd.)

FIG. 4. Everted hemipenis of *P. d. perkinsi*.

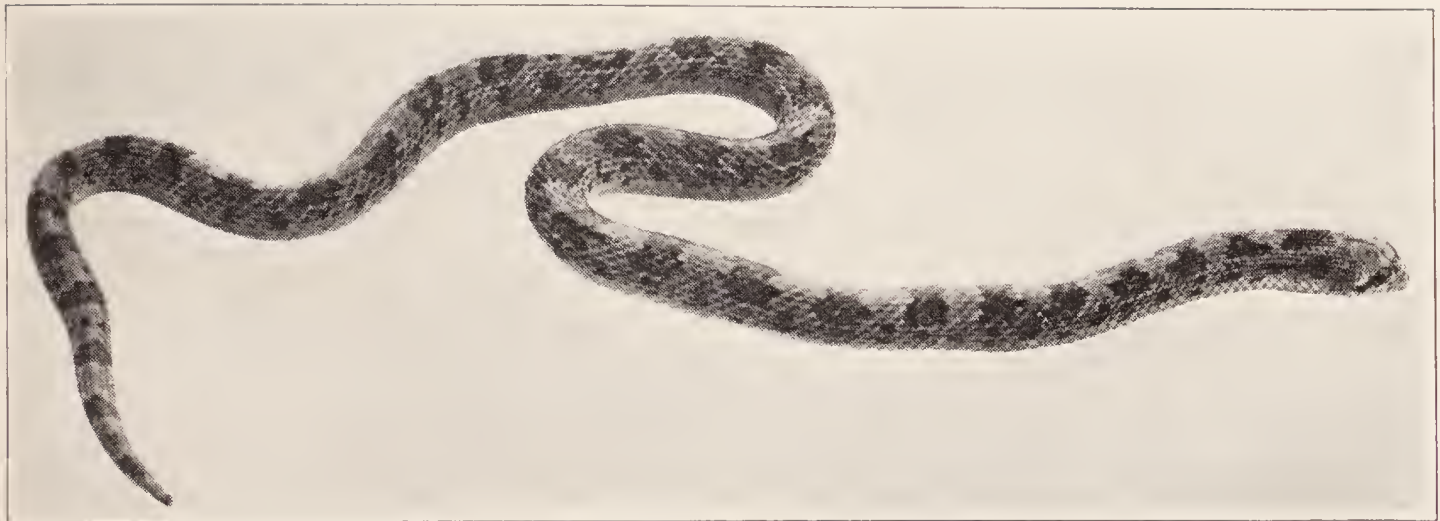


FIG. 1.

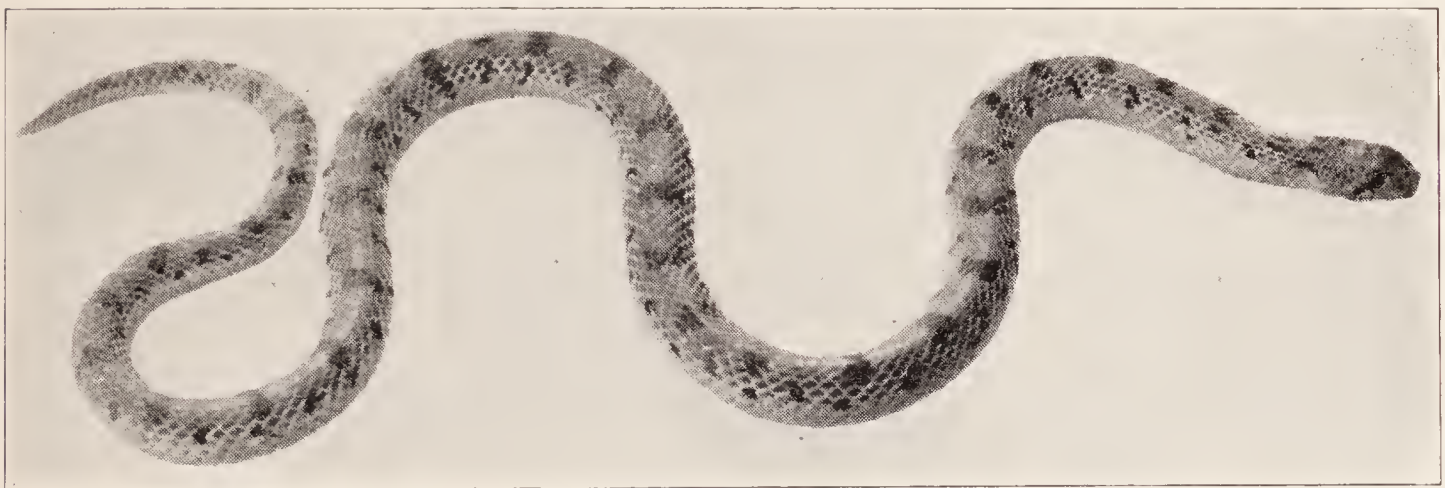


FIG. 2.

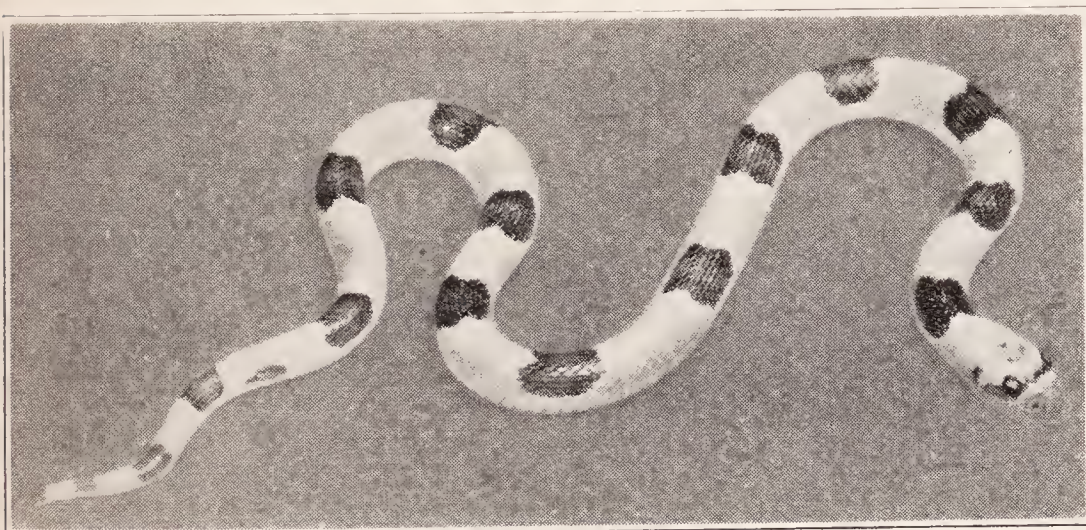


FIG. 3.



FIG. 4.